

**Final Assessment of Threatened and Endangered
Marine and Anadromous Fish Presence Adjacent to
Zelatched Point:
2016 Beach Seine Survey Results**

Prepared for:

Naval Facilities Engineering Command Northwest (NAVFAC NW)

Submitted by:

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FINAL REPORT

For Cooperative Agreements N44255-14-2-0006 & N44255-15-2-0002

April 2017



Suggested citation: Frierson, T., Dezan, W., Lowry, D., LeClair, L., Hillier, L., Pacunski, R., Blaine, Hennings, A., Phillips, A., Campbell, P. (2017). Final assessment of threatened and endangered marine and anadromous fish presence adjacent to Zelatched Point: 2016 beach seine survey results. Final report to NAVFAC NW. Washington Department of Fish and Wildlife. Olympia, WA.



Executive Summary

Puget Sound is home to a variety of marine and anadromous fish species that are afforded legal protection under the Endangered Species Act (ESA). The ESA-listed fish species within Puget Sound most relevant to this study include three species of rockfish (Yelloweye, Canary, and Bocaccio), four species of salmonid (Chinook, Hood Canal summer-run Chum, steelhead, and Bull Trout), and one species of forage fish (Eulachon). In an effort to determine whether occurrence of these ESA-listed species has the potential to affect operations in the waters adjacent to Zelatched Point, the Naval Facilities Engineering Command Northwest (NAVFAC NW) and the Washington Department of Fish and Wildlife (WDFW) entered into a cooperative agreement whereby the WDFW agreed to survey these waters to evaluate both the seasonal and resident presence of ESA-listed fish.

Zelatched Point, at the control center for the Dabob Bay Range Complex in Hood Canal, was surveyed by the WDFW in 2015 and 2016 using various techniques and technologies. After reviewing the geographic scope, depth profile, water quality, and security restrictions associated with the survey area, it was determined that a combination of sampling methods including scuba diving, split-beam echosounder (hydroacoustics), and beach seining would be used to survey the pier and the immediate offshore area. Beach seine surveys targeted forage fish and juvenile salmonids in the nearshore, while all other sampling techniques were appropriate to surveying rockfish and critical habitat for all species. Surveys for rockfish were conducted once in February 2015, while surveys for forage fish and juvenile salmonids occurred monthly in 2016 in order to detect temporal changes in fish abundance or distribution. See Appendix A for a comprehensive list of fish species recorded for beach seining in 2016. For results on rockfish, their critical habitat, and a description of sampling methods other than beach seine see the 2015 final report.

There were two confirmed ESA-listed species captured with the beach seine at Zelatched Point, Hood Canal summer-run Chum and Chinook Salmon. Summer-run Chum Salmon cannot be visually distinguished from fall-run Chum Salmon juveniles; therefore, tissue samples collected in 2016 facilitated run assignment through genetic analysis in a separate report. Sampling at Zelatched Point in 2016 began in February, and at NAVBASE Kitsap Bangor in January, with the intention to capture Hood Canal summer-run Chum Salmon that were detected in nearshore areas earlier (January-February) than fall-run Chum Salmon (March-April). Chinook Salmon were captured at low catch rates from May through September 2016. However, based on results from 2016 we preliminarily conclude that in order to reduce impact on juvenile salmon, the work window (July 15 to January 15) for the Zelatched Point facilities' in-water maintenance, military construction (MILCON), mitigation projects, future Fleet training and testing should not include February through July, as is consistent with the measures outlined in [WAC 220-660-330](#). We recommend that the aforementioned activities should also be avoided during August and September due to potential late occurrence of Chinook Salmon in the nearshore, which is not consistent with the measures outlined in [WAC 220-660-330](#).

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Background

The inland marine waters of Washington State, which include all waters east of Cape Flattery and south of the Canadian border (i.e., Puget Sound), are inhabited by a variety of species that have been afforded legal protection under the Endangered Species Act (ESA) due to a reduction in their range, average biomass, a combination of these population-level parameters, and/or their inherent “value” to humankind. This value may stem from fisheries or other exploitative uses, ecotourism, other non-exploitative uses, or recognition of the integral ecological role a species plays in the local or regional food web ([NMFS online](#)). Several fishes protected under the ESA within Puget Sound include Eulachon (*Thaleichthys pacificus*) (NMFS 2010a), Chinook Salmon (*Oncorhynchus tshawytscha*) (NMFS 1999a), Hood Canal summer-run Chum Salmon (*O. keta*) (NMFS 1999b), steelhead (*O. mykiss*) (NMFS 2007), and Bull Trout (*Salvelinus confluentus*) (USFWS 1999). Each of these species is listed as Threatened, being significantly reduced in abundance and experiencing ongoing pressure from several threats, but not under imminent threat of extirpation or extinction. In 2010, ESA protection was extended to three species of rockfish within a geographic area that includes the vast majority of Puget Sound (NMFS 2010b); Yelloweye Rockfish (*Sebastes ruberrimus*) and Canary Rockfish (*S. pinniger*) were afforded Threatened status, while Bocaccio (*S. paucispinis*) received an Endangered designation.

These ESA-listings have the capacity to influence nearshore construction activities and at-sea operations of private and government sector vessels. As a result, the United States Department of the Navy (DON) desired to understand the species composition, timing, and migration of ESA-listed Threatened and Endangered (T&E) fish, and additionally ensure compliance with the Fish and Wildlife Conservation Act, Magnuson-Stevens Fishery Conservation and Management Act, and the Sikes Act Improvement Act at the following nine Naval installations: Naval Air Station (NAS) Whidbey Island Crescent Harbor, NAS Whidbey Island Lake Hancock, Naval Magazine (NAVMAG) Indian Island, Naval Base (NAVBASE) Kitsap Keyport, NAVBASE Kitsap Bremerton, NAVBASE Kitsap Bangor, Naval Station (NAVSTA) Everett, Manchester Fuel Department (MFD), and Zelatched Point. A Cooperative Agreement (CA) was established between the DON and the Washington Department of Fish and Wildlife (WDFW) to design and implement studies to assess shoreline and adjacent marine water use by ESA-listed fish species. It was further agreed that the WDFW, based on known ESA-listed fish habitat preferences and trophic relationships, would also assess the suitability of the habitat and prey for supporting ESA-listed fish at each of the nine installations.

The four primary project tasks identified in the CA are: 1) a kick-off meeting to formalize the monitoring project planning and management; 2) develop survey protocols and a study plan; 3) conduct field surveys and collect field data; and 4) provide a final report documenting results of surveys at Navy installations. In accordance with Tasks 1 and 3, a kick-off meeting between principle participants from the WDFW and NAVFAC NW personnel was held in November 2015. The meeting included discussions on security, access, survey methods, scheduling, logistics, and installation-specific survey priorities. Monthly progress reports were prepared by the WDFW, and meetings were held periodically to discuss headway and to identify and resolve any impediments to the project. The WDFW coordinated and communicated extensively with installation security and other personnel to arrange for access at prescribed times and locations. Task 2 is detailed under headings below, and this report meets the deliverables requirement for the final task by detailing all research conducted as part of this cooperative agreement at Zelatched Point.

Methods

Study Area

Zelatched Point is located along the eastern shore of Dabob Bay (Figure 1a), which includes the control center for the Dabob Bay Range Complex in Hood Canal (Figure 1b). The study area was restricted to the shoreline east of the Zelatched Point pier due to the sensitive cable array placement west of the pier. The majority of bottom habitat is considered featureless mud and sand (NOAA nautical chart 18458), with vegetative habitat features including nearshore eelgrass (*Zostera* spp.) ([WA DOE Coastal Atlas Map](#)).

Within the study area, survey sites were sampled with a beach seine along the eastern shoreline adjacent to the Zelatched Point pier (Figure 2). This accretion shoreform beach has not been historically documented as a forage fish spawning location ([WDFW online](#)).

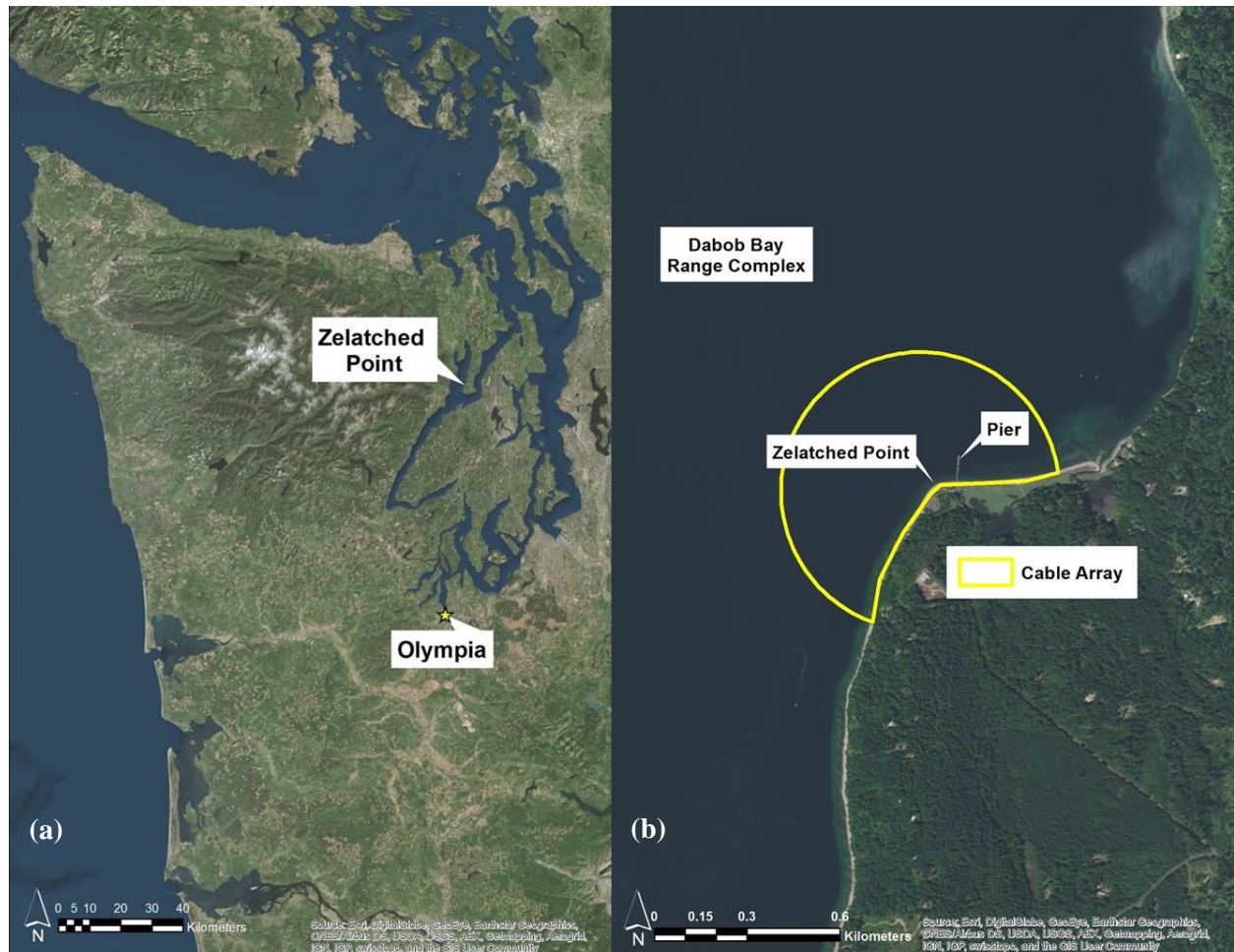


Figure 1. Orthophoto of the Zelatched Point facility location in Puget Sound (a) showing the Dabob Range Complex, cable array, and pier (b). Image from Esri DigitalGlobe.



Figure 2. Orthophoto of Zelatched Point identifying the beach seining survey sites east of the pier. Image from Esri DigitalGlobe.

Survey Design

Beach seining allows fish to be collected in the intertidal and shallow subtidal zone (<5m deep) where few other techniques are capable of sampling. This is critically important for assessing forage fish and juvenile salmonids because they rely heavily on this nearshore zone for spawning, feeding, refuge, and/or migration. From the possible array of shorelines controlled by the DoN in need of assessment, sampling sites were selected based on the priorities of Navy personnel to determine fish presence and occupancy timing adjacent to the Zelatched Point pier while avoiding contact with the sensitive cable array. These sites were sampled monthly from February to September in 2016 at high-slack tides, which are known to be preferred by beach-spawning forage fish and migrating juvenile salmonids. A minimum of two beach seine “sets” were performed on a single date each month. Sampling typically began closest to the pier structure, and subsequent sets were deployed eastward along the beach towards the Navy property line. All fish captured during sampling were identified, counted, and released.

Beach Seining Survey Protocols

Beach seine surveys were conducted during daylight hours, within two hours of high-slack tide using a 5.5m WDFW research vessel (aluminum hull, 115hp outboard motor) equipped with a bowpicker. The beach seine was 36.6m long x 3.7m deep with 3.2mm knotless nylon mesh (Cristensen Net Works - Everson, WA). The net was cut to taper from 1.8m to 3.7m deep in the leading 18.3m of net, followed by 18.3m of netting 3.7m deep (Figure 3). This “Skagit” net design is widely used by the WDFW, Wild Fish Conservancy (WFC), Skagit River System Cooperative (SRSC), and many other organizations to assess nearshore fish assemblages throughout the Puget Sound region.

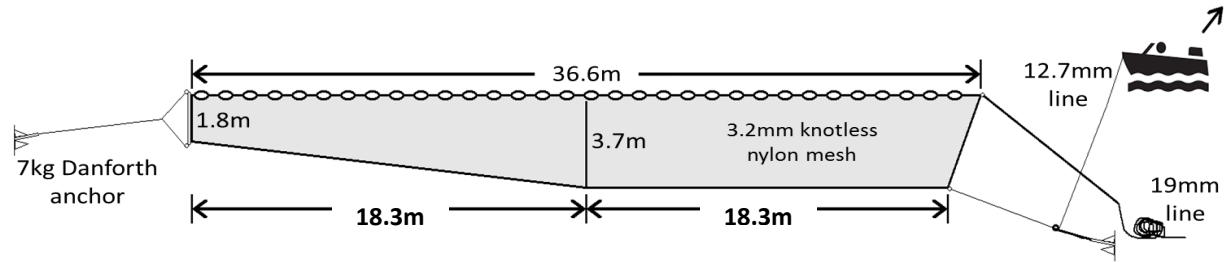


Figure 3. Diagram of the beach seine with dimensions used for sampling.

During sampling, the shallow end of the net was anchored to the beach with a 7kg Danforth anchor and deployed perpendicular to the beach. A haul line of 19mm braided nylon attached to the deep end of the net was secured to the bow with approximately 10m of line between the boat and end of the net. The net was towed by the boat in reverse against the current in a “round haul” fashion and returned towards shore at a point approximately 75% of the net’s length (Figure 4). As the boat approached shore, a second line of 12.7mm, three-strand nylon attached at the net’s lead line was tossed to a crew member on shore, passed through a stainless steel snatch block attached to a second anchor, and returned to the boat where it was secured to a post on the bow. The boat then carefully reversed away from shore pulling the line through the anchored snatch block, and landing the net on the beach (Figure 5a). Set durations ranged from three to five minutes from net deployment to landing on the beach, and each sampling trip typically included two sets on a given date.



Figure 4. Photo taken while beach seining showing the “round haul” net deployment method into the current.



Figure 5. Photo taken during a beach seine set showing the use of a snatch block anchored to shore and research vessel to land the net (a). The WDFW beach seine staff sorting fish species in the landed net enclosure (b).

Upon landing the net, smaller catches were transferred to 113L containers that were aerated by bubblers and regularly irrigated with fresh seawater. Larger catches were retained in the net enclosure to minimize heat and oxygen stress during handling. Each set's catch was sorted and identified to the lowest possible taxonomic level and enumerated before release (Figure 5b). Holding time was often less than 5 minutes and not longer than 15 minutes. A subsample of each species of forage fish (n=40) and juvenile salmonid (n=20) was measured (fork length) to the nearest millimeter for each sampling trip. Salmonids were checked for adipose fin presence/absence to determine hatchery or natural-origin, if applicable. In addition to collecting biological data specific to catch, information describing weather, water surface conditions, depth, tide stage and elevation, primary and secondary substrate characteristics, and amount of algae in each set was recorded.

Results

Beach Seine Surveys in 2016

Beach seine sampling occurred along the eastern shoreline of the Zelatched Point pier once a month from February to September 2016 (see Figure 2). A total of 14 sets were completed, with two sets occurring on each date. No sampling was done in April due to extremely high Chum Salmon densities (509 fish/set) encountered at the Bangor sites that potentially exceeded the expected take of ESA-listed Chum requested on the project's collection permit. Maximum nearshore water depths recorded while sampling the sites averaged 3.6m.

A total of 18 fish species were captured over seven months of sampling. Overall catch composition consisted primarily of Northern Anchovy (*Engraulis mordax*), Chum Salmon, Shiner Perch (*Cymatogaster aggregata*), and Pink Salmon (*O. gorbuscha*) (Table 1). Species richness varied monthly from 2 to 10 species captured during each sampling trip, with peak species richness observed in May (Figure 6). Fork lengths were recorded from a total of 42 forage fish and 40 salmonids during the seven months of sampling at both sites (Table 2). Chum and Pink Salmon length data were not collected during March sampling at Zelatched Point; however they were recorded from fish captured at the Naval Base Kitsap Bangor on the same day.

Table 1. Total number of beach seine sets completed and counts of all marine fish captured by sampling month in 2016.

Species	2-Feb	7-Mar	13-May	14-Jun	12-Jul	11-Aug	7-Sep	Total	% of Total
# Sets Completed	2	2	2	2	2	2	2	14	-
Bay Pipefish	2		2	3	1			8	0.56%
Chinook Salmon			6		5	5	7	23	1.60%
Chum Salmon		160	5	1				166	11.56%
Coho Salmon			2	1			3	6	0.42%
Crescent Gunnel					1			1	0.07%
Cutthroat Trout			3	1				4	0.28%
Northern Anchovy						935		935	65.11%
Pacific Herring				1				1	0.07%
Pile Perch							2	2	0.14%
Pink Salmon		92						92	6.41%
Plainfin Midshipman	1							1	0.07%
Saddleback Gunnel					1			1	0.07%
Sharpnose Sculpin			1					1	0.07%
Shiner Perch			17	94	38	6	8	163	11.35%
Sockeye Salmon					1			1	0.07%
Staghorn Sculpin			2	3	15		1	21	1.46%
Starry Flounder			3				4	7	0.49%
Threespine Stickleback			1	2				3	0.21%

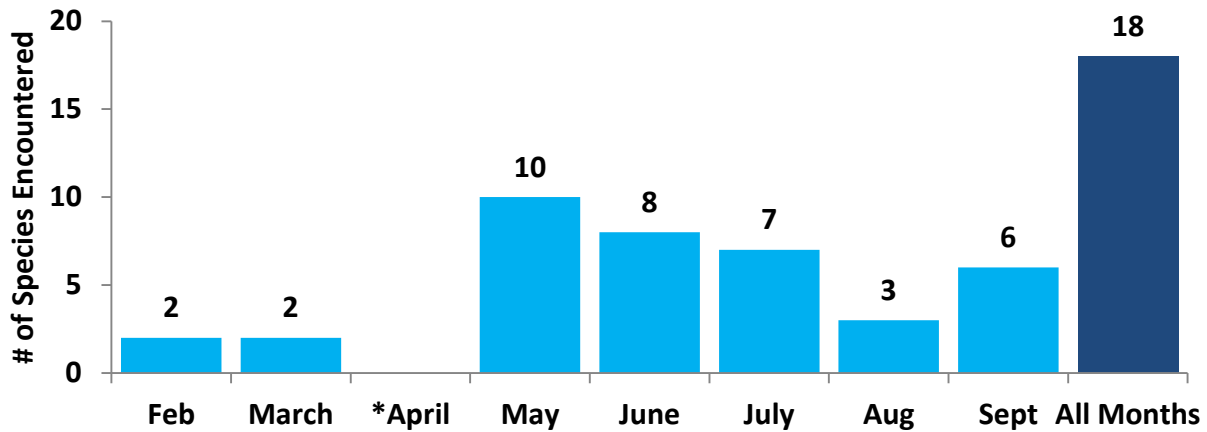


Figure 6. Species richness of all fish captured during beach seining, by month and all months combined in 2016. *Did not sample in April.

Table 2. Fork length (mm) data summaries for juvenile salmonid (left) and all forage fish (right) species sampled in 2016. *Indicates adult salmonids (>300mm).

Species	Mean \pm SD	CV	n	Species	Mean \pm SD	CV	n
Chinook natural	93.25 \pm 11.81	0.13	4	Northern Anchovy	41.44 \pm 2.98	0.07	41
Chinook hatchery	142.07 \pm 33.56	0.24	14	Pacific Herring	137	-	1
Chinook hatchery*	650 \pm 14.14	0.02	5				
Coho natural	104	-	1				
Coho hatchery	167 \pm 110.31	0.66	2				
Coho natural*	395	-	1				
Coho hatchery*	572.5 \pm 38.89	0.07	2				
Chum Salmon	56.17 \pm 11.97	0.21	6				
Sockeye Salmon*	570	-	1				
Cutthroat Trout	134 \pm 26.32	0.20	4				

Forage fish species captured in 2016 included Northern Anchovy and Pacific Herring (*Clupea pallasii*), however rarely encountered (Figure 7). High densities of post-larval Northern Anchovy were captured in August, but absent during all other sampling events. A single adult Pacific Herring was captured in June, with an age-length estimate of age-1 (Buchanan 1985). No ESA-listed Eulachon were captured during any beach seine sampling.

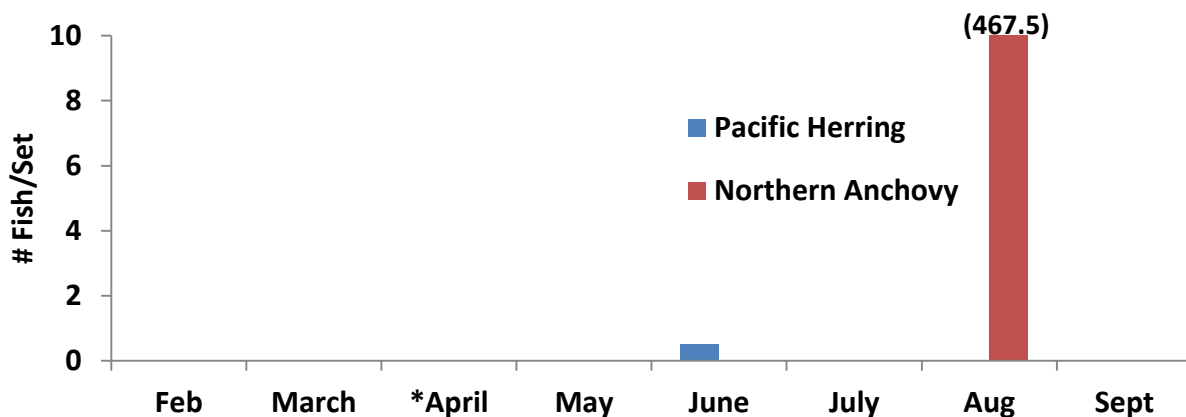


Figure 7. Catch rates for forage fish species captured during beach seining for all sites combined in 2016. Values are labeled for catch rates exceeding the vertical axis. *Did not sample in April.

Salmonid species captured in 2016 included Chinook Salmon, Coho Salmon (*O. kisutch*), Chum Salmon, Pink Salmon, Sockeye Salmon (*O. nerka*), and Cutthroat Trout (*O. clarkii*) with variable catch rates observed from March through September (Figure 8). Salmonid fork lengths generally increased for each species' cohort, as a consequence of seasonal growth after outmigration from local watersheds, during the sampling period (Figure 9). Chinook Salmon juveniles were captured during May through September sampling (except June) at low catch rates (1-2 fish/set), and adults were only captured during July (n=3) and September (n=2). Overall, Chinook consisted of 19 hatchery and 4 natural-origin fish. Coho Salmon juveniles were captured in May (n=2) and September (n=1), and adults were captured in June (n=1) and September (n=2). Overall, Coho were identified as 4 hatchery and 2 natural-origin fish. Chum Salmon were encountered at high densities in March (80 fish/set) and quickly declined through June (<1 fish/set). Genetic analysis of Chum tissue samples from both Zelatched Point and the NAVBASE Kitsap Bangor revealed that ESA-listed Hood Canal summer-run fish comprised 97% of all Chum captured in both January and February, while 84% of all Chum captured from March through May were fall-run fish (Figure 10). Pink Salmon were only captured in March (46 fish/set). A single adult Sockeye Salmon was captured in July. Cutthroat Trout were only captured in May (n=3) and June (n=1).

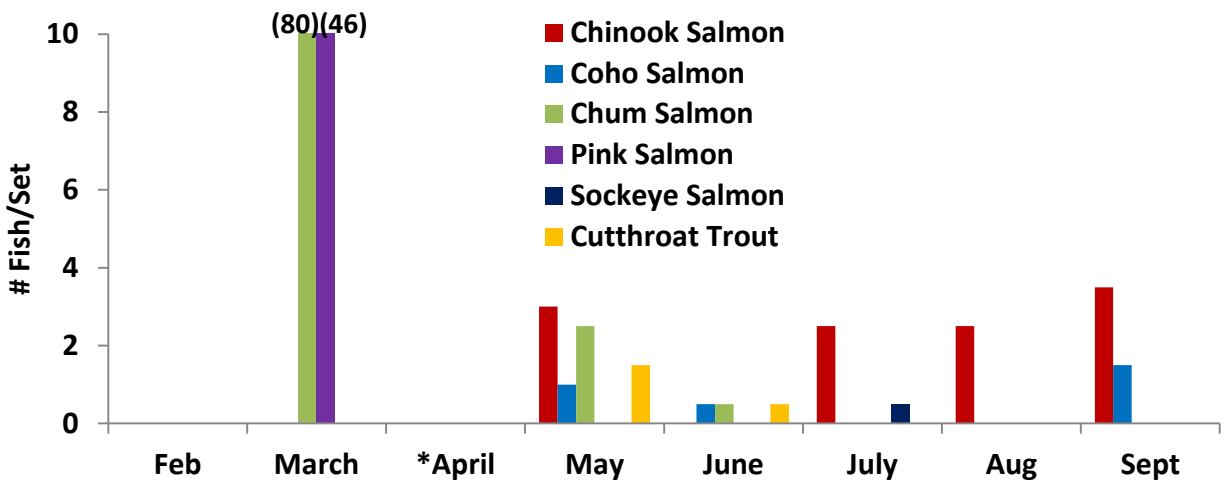


Figure 8. Catch rates for salmonid species captured during beach seining, by month for all sites combined in 2016. Values are labeled for catch rates exceeding the vertical axis. *Did not sample in April.

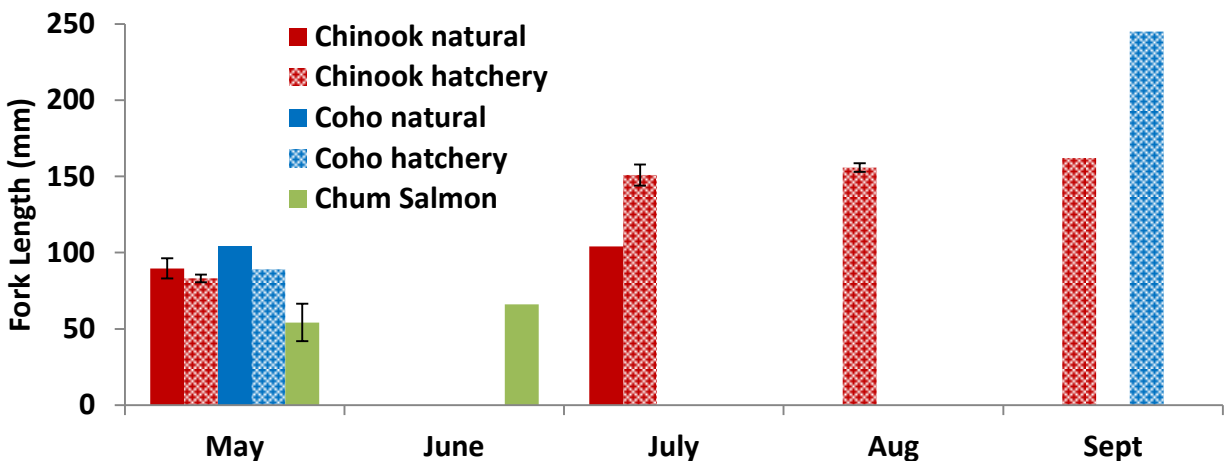


Figure 9. Mean fork length (\pm 1SE) for juvenile salmonid species by month for all sites in 2016.

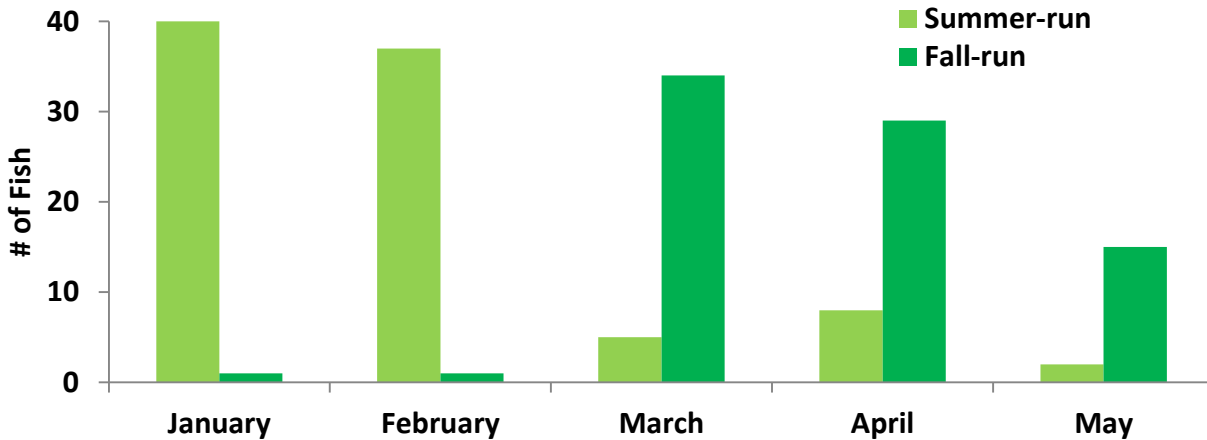


Figure 10. Run assignment of Chum Salmon captured in Hood Canal, by month in 2016.

Discussion

Beach seine surveys were completed to assess ESA-listed forage fish and salmonid species' use of marine nearshore habitats, specifically with regard to their timing, distribution, and relative abundance adjacent to Zelatched Point. This report intends to establish a baseline dataset for Zelatched Point and compare with the 2015-16 surveys of forage fish and salmonids, conducted with the same design, using a beach seine along the NAVBASE Kitsap Bangor shoreline (see Frierson et al. 2017). Past studies along the Bangor shoreline have also focused their sampling efforts from January through early and late summer to assess the different outmigration patterns of each salmonid species (see Schreiner et al. 1977; Bax et al. 1978, 1979, 1980; Salo et al. 1980; SAIC 2006, 2009).

In Puget Sound, forage fish species occupy every marine and estuarine nearshore habitat, and their spawning habitats all commonly occur within the nearshore zone of Pacific Northwest beaches (Penttila 2007). However, little is known about any forage fish species away from their spawning grounds (Penttila 2007). Due to their critical role as prey species for salmon and marine mammals, conservation efforts regarding their abundance trends and spawning habitats have been considerably emphasized. Overwater structures (e.g., docks, piers, floats, boathouses) have potential negative impacts on these spawning habitats, but they vary depending on the species and the size and configuration of the structure (Nightingale and Simenstad 2001, Penttila 2007). The extent of which the overwater pier structure at Zelatched Point may impact forage fish spawning grounds remains uncertain. There are specific areas within Dabob Bay that are well documented for Pacific Herring, Pacific Sand Lance, and Surf Smelt (*Hypomesus pretiosus*) spawning areas; however Zelatched Point has not been historically documented as forage fish spawning habitat ([WDFW online](#)). Zelatched Point may serve as a suitable nursery habitat for post-larval Northern Anchovy, based on the high densities captured in August. Northern Anchovy are pelagic broadcast spawners (Emmett et al. 1991) and do not rely on intertidal substrates during their early life history.

Overall, forage fish were generally absent at Zelatched Point, besides a single Pacific Herring and one large catch of Northern Anchovy. The 2015-16 beach seine surveys at Bangor captured many Pacific Herring, Pacific Sand Lance, and Surf Smelt from June through September (Frierson et al. 2017). Northern Anchovy were also encountered at Bangor in August and September 2016, but only at very low catch rates. No ESA-listed species of forage fish (i.e., Eulachon) were captured during the 2015-16 sampling at Zelatched Point or Bangor, and are not documented to commonly occur in Hood Canal (Pietsch and Orr 2015). The SAIC (2006, 2009) survey reports indicated the capture of very few

Eulachon in 2006 (n=5) and 2008 (n=2), which could plausibly be transient migrants from Canadian stocks (i.e., Fraser River). The inconsistency of forage fish catches among locations and survey years could be indicative of natural interannual variation driven by sea surface temperature, prey abundance, or other factors affecting both broad-scale population demographics and localized habitat usage.

Pacific Salmon (*Oncorhynchus* spp.) depend upon a wide range of habitats throughout their life cycle (Groot and Margolis 1991, Nightingale and Simenstad 2001). The nearshore zone along the northern reaches of Hood Canal, including the Zelatched Point and Bangor shoreline, serves as an essential migration route for nearly all juvenile salmonids (natural and hatchery) produced in the Hood Canal region. When these juveniles enter the marine environment from their natal streams, they depend upon nearshore vegetated habitats for prey resources and shelter from predation. In this way, shallow nearshore habitats are critical to the survival of such species (Naiman and Seibert 1979; Simenstad 1979, 1980, 1982; Healey 1982; Johnson et al. 1997; Nightingale and Simenstad 2001). Overwater structures have been well documented to impact fish migration behavior and increase mortality by creating sharp underwater light contrasts in ambient daylight conditions as well as artificial lights cast during nighttime conditions (Nightingale and Simenstad 2001). Salo et al. (1980) studied the effects of construction of Naval facilities on the outmigration of juvenile salmonids from Hood Canal; they concluded that the long-term effects of construction and operation upon the prey communities of outmigrating Chum and Pink Salmon fry were expected to be minimal as long as extensive areas of shallow eelgrass habitat were not destroyed. They also speculated that the illumination of the nearshore environment during nighttime was likely to alter the composition and standing stock of prey communities available to the salmon fry during their normal crepuscular feeding periods.

Past studies have documented the presence and timing of outmigrating juvenile salmonids along the Bangor shoreline to begin in January and continue through the summer (Schreiner et al. 1977; Bax et al. 1978, 1979, 1980; Salo et al. 1980; SAIC 2006, 2009). Each of these studies reported that juvenile Chum Salmon was the predominant salmonid species captured with a beach seine, followed by Coho and Pink (in even years), while relatively few Chinook and Cutthroat Trout were encountered. They also reported that juvenile steelhead were very rarely captured. Overall, the relative abundance and timing of each juvenile salmonid species reported in these past studies appears to have remained stable, coinciding with the 2015-16 survey results at Bangor and Zelatched Point. Hatchery releases also corresponded to abundance and timing of salmonids captured in past studies and the 2015-16 surveys. Millions of hatchery produced juvenile salmonids are released throughout Hood Canal every year to provide increased recreational and commercial harvest opportunities, as well as supplement the recovery and conservation of naturally-spawning salmon populations. In 2015 and 2016, approximately 80% of all the Hood Canal hatchery releases were composed of unmarked fish, meaning they could not be visually distinguished from naturally produced fish (see Appendix B and C).

Chum Salmon dominated the catch at Zelatched Point in March, and at Bangor from January to April 2016. In fact, such high densities of Chum Salmon were captured at Bangor in April 2016 that sampling was aborted after two sets to reduce any negative impact potentially caused by capturing and handling that many salmon fry, as well as limit the 'expected takes' of ESA-listed fish authorized by the NOAA 4d permit. Unmarked Chum Salmon fry comprised over 76% of all Hood Canal hatchery released fish in both survey years, with the vast majority (>26 million) being released in April. Hood Canal summer-run Chum Salmon are an ESA-listed species stock, but they are indistinguishable from fall-run Chum Salmon stocks by visual identification methods. We did not conduct the genetic analyses necessary to differentiate the two stocks potentially encountered during 2015 sampling. However, tissue samples were collected during January through May 2016 sampling in Hood Canal and Admiralty Inlet. Hood Canal summer-run Chum Salmon are typically expected to emerge into the marine environment earlier (January to March) than fall-run Chum stocks (March to June), which are greatly supplemented with hatchery fall Chum Salmon releases in April (Ames et al. 2000, Cook-Tabor 1995, Fletcher et al. 2013). A five year

study at a WDFW screw trap in the Duckabush River showed that peak outmigration of summer-run Chum occurred between the last week of February and the middle of March, while fall-run Chum migrated over a more protracted time period (Weinheimer 2016). The presence of Hood Canal summer-run Chum Salmon at Zelatched Point and the NAVBASE Kitsap Bangor was confirmed by genetic analysis of the 2016 samples, and is detailed in a separate report funded by another cooperative agreement (Small et al. 2017). These 2015-16 data were consistent with recent genetic assignment studies for Chum in the Hood Canal region, as the majority (97%) of Chum sampled in January and February were summer-run fish, while the majority (84%) of Chum captured from March through May were fall-run fish.

High densities of Pink Salmon juveniles were also captured during March 2016 sampling at Zelatched Point, which corresponds with the species' dominant biennial spawning (during odd years) in Puget Sound rivers and hatchery release of nearly half a million unmarked fish in March 2016. The timing and abundance for Pinks observed Zelatched Point closely aligns with the 2016 survey along the Bangor shoreline (Frierson et al. 2017).

Chinook Salmon was a confirmed ESA-listed species captured at Zelatched Point, with low catch rates of both juveniles and adults occurring from May through September. The 2015-16 surveys at Bangor also encountered Chinook at relatively low catch rates during the same months (Frierson et al. 2017). This corresponded to the hatchery releases of over six million fish in both May and June of 2015-16, consisting of 93% (2015) and 86% (2016) adipose clipped fish. For both Zelatched Point and Bangor surveys, the majority (79%) of captured Chinook were hatchery produced (adipose clipped) rather than naturally produced (non-clipped) fish, which is consistent with the hatchery release marked fish rate.

Very few Coho Salmon juveniles were captured at Zelatched Point in May 2016, as compared to the moderate catches observed during surveys at Bangor in May 2015-16 (Frierson et al. 2017). This timing corresponds with the hatchery releases of over 1.3 million total Coho in both April and May of 2015-16, consisting of approximately 90% adipose clipped fish. However, only 21% of Coho captured at Zelatched Point and Bangor combined during the 2015-16 surveys were hatchery produced (adipose clipped). The SAIC surveys in 2005-06 and 2007-08 also reported a similar capture rate (21-37%) for adipose clipped Coho (SAIC 2006, 2009).

Conclusions

Overall, the relative timing and abundance of salmonids sampled with a beach seine at Zelatched Point in 2016 were consistent with 2015-16 and historical surveys conducted along the NAVBASE Kitsap Bangor shoreline. Collectively, these studies indicate that whatever impacts to the nearshore habitat, as used by juvenile salmonids, due to the Zelatched Point facilities have remained consistent over time. Forage fish were nearly absent throughout 2016 sampling, and these results may be used as a baseline for future studies. Since the overwater pier structure at the Zelatched Point shoreline occurs over 'saltwater habitats of special concern' ([WAC 220-660-320](#)), mitigation including periodic monitoring of fish and habitat is recommended to ensure optimal health.

The rockfish surveys conducted at Zelatched Point in 2015 observed very few rockfish directly associated with the pier structure on the scuba survey, and no hard substrates or complex habitat were detected with the hydroacoustic survey. None of the rockfish species recorded at the Zelatched Point pier in 2015 were protected under the ESA, and neither the habitat nor depths recorded at the pier were consistent with known associations to support ESA-listed rockfish species elsewhere in Puget Sound. Based on the results from the 2015 surveys, we preliminarily conclude that the Zelatched Point pier is unlikely to

support ESA-listed rockfish species at any life history stage, or their preferred deep-water habitats (see Frierson et al. 2016).

The two confirmed ESA-listed species captured with the beach seine at Zelatched Point were Hood Canal summer-run Chum and Chinook Salmon. Hood Canal summer-run Chum Salmon were detected in nearshore areas, for Zelatched Point and Bangor combined, earlier (January-February) than fall-run Chum Salmon (March-April). Chinook were captured at low catch rates from May through September. Based on these results from 2016, we preliminarily conclude that in order to reduce impact on juvenile salmon, the work window (July 15 to January 15) for Zelatched Point facilities' in-water maintenance, military construction (MILCON), mitigation projects, future Fleet training and testing should not include February through July, as is consistent with the measures outlined in [WAC 220-660-330](#). We recommend that the aforementioned activities should also be avoided during August and September due to potential late occurrence of Chinook Salmon in the nearshore, which is not consistent with the measures outlined in [WAC 220-660-330](#).

Acknowledgements

The WDFW Marine Fish Science Unit would like to thank all the NAVFAC NW biologists and staff for their support throughout these survey periods. They include Sharon Rainsberry, Cindi Kunz, Eleanor Drake, Eileen Mitchell, Stephanie Sleeman, Julia Stockton, Sara Street, Doug Tailleur, Linda Wagoner, Michael Bianchi, John Phillips, Jim Zimmer, Gregory Erxleben, James Cortez, Jerry Taylor, Mark Taylor, Steve Polillo, Blair Kipple, Amy Fowler, Sarah Maher, Alex Russell, Brendan Himelright, and Dawn Grebner.

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Appendix A: Comprehensive list of all fish species recorded at Zelatched Point in 2016 with the beach seine. Taxonomic nomenclature and phylogenetic organization follows arrangement from Pietsch and Orr (2015) unless otherwise noted.

TAXON	COMMON NAME
CLUPEIFORMES	HERRINGS
Engraulidae	Anchovies
<i>Engraulis mordax</i>	Northern Anchovy
Clupeidae	Herrings and Sardines
<i>Clupea pallasii</i>	Pacific Herring
SALMONIFORMES	TROUTS
Salmonidae	Trouts and Salmon
<i>Oncorhynchus clarkii</i>	Cutthroat Trout (coastal)
<i>Oncorhynchus gorboscha</i>	Pink Salmon
<i>Oncorhynchus keta</i>	Chum Salmon
<i>Oncorhynchus kisutch</i>	Coho Salmon
<i>Oncorhynchus nerka</i>	Sockeye Salmon
<i>Oncorhynchus tshawytscha</i>	Chinook Salmon
BATRACHOIDIFORMES	TOADFISHES
Batrachoididae	Toadfishes
<i>Porichthys notatus</i>	Plainfin Midshipman
GASTEROSTEIFORMES	STICKLEBACKS
Gasterosteidae	Sticklebacks
<i>Gasterosteus aculeatus</i>	Threespine Stickleback
Syngnathidae	Pipefishes
<i>Syngnathus leptorhynchus</i>	Bay Pipefish
SCORPAENIFORMES	MAIL-CHEEKED FISHES
Cottidae	Sculpins
<i>Clinocottus acuticeps</i>	Sharpnose Sculpin
<i>Leptocottus armatus</i>	Pacific staghorn Sculpin
PERCIFORMES	PERCHES
Embiotocidae	Surfperches
<i>Cymatogaster aggregata</i>	Shiner Perch
<i>Rhacochilus vacca</i>	Pile Perch
Pholidae	Gunnels
<i>Pholis laeta</i>	Crescent Gunnel
<i>Pholis ornata</i>	Saddleback Gunnel
PLEURONECTIFORMES	FLATFISHES
Pleuronectidae	Righteye Flounders
<i>Platichthys stellatus</i>	Starry Flounder

Appendix B: Hatchery releases in the Hood Canal (HOOD) region during 2015. Data summarized from the [Regional Mark Information System \(RMIS\)](#).

Species	Release Region	Release Year	Release Month	CWT only	CWT + Ad Clip	Unmarked	Ad Clip only	Mean Length (mm)
Chinook	HOOD	2015	April		98,666		24,940	168
Chinook	HOOD	2015	May	495,167	227,775	22,237	5,544,930	84
Chinook	HOOD	2015	June		199,169	5,761	818,297	79
TOTAL				495,167	525,610	27,998	6,388,167	
Chum	HOOD	2015	February			290,000		
Chum	HOOD	2015	March			79,930		58
Chum	HOOD	2015	April			27,692,461		54
Chum	HOOD	2015	December			210,400		
TOTAL						28,272,791		
Coho	HOOD	2015	April	122,218	162,222	6,576	668,693	136
Coho	HOOD	2015	May	2,595	47,140	4,862	342,422	
TOTAL				124,813	209,362	11,438	1,011,115	
Cutthroat	HOOD	2015	January			200		
Cutthroat	HOOD	2015	May			27,967		
Cutthroat	HOOD	2015	June			7,030		
Cutthroat	HOOD	2015	September			6,750		
TOTAL						41,947		
Steelhead	HOOD	2015	February				78	498
Steelhead	HOOD	2015	March				467	535
Steelhead	HOOD	2015	April				300	182
Steelhead	HOOD	2015	May			11,322	8,786	182
TOTAL						11,322	9,631	

Appendix C: Hatchery releases in the Hood Canal (HOOD) region during 2016. Data summarized from the [Regional Mark Information System \(RMIS\)](#).

Species	Release Region	Release Year	Release Month	CWT only	CWT + Ad Clip	Unmarked	Ad Clip only	Mean Length (mm)
Chinook	HOOD	2016	April	122,483		7,650	121,065	174
Chinook	HOOD	2016	May	423,410	221,164	51,992	2,885,833	86
Chinook	HOOD	2016	June		200,979	4,446	2,218,283	80
Chinook	HOOD	2016	August	277,780		2,236		
TOTAL				823,673	422,143	66,324	5,225,181	
Chum	HOOD	2016	February			165,024		
Chum	HOOD	2016	March			30,220		
Chum	HOOD	2016	April			26,755,074		53
TOTAL						26,950,318		
Coho	HOOD	2016	April	117,540	117,719	2,298	524,739	125
Coho	HOOD	2016	May		83,127	384	496,235	
TOTAL				117,540	200,846	2,682	1,020,974	
Cutthroat	HOOD	2016	January			350		
Cutthroat	HOOD	2016	May			39,184		
Cutthroat	HOOD	2016	August			310		
Cutthroat	HOOD	2016	October			6,437		
TOTAL						46,281		
Pink	HOOD	2016	March			491,572		51
TOTAL						491,572		
Steelhead	HOOD	2016	April			9,691	2,749	208
Steelhead	HOOD	2016	May			5,478	2,790	205
TOTAL						15,169	5,539	